Amendments to the Specification:

Please replace paragraph [0003] [0004] [0005] with the following amended paragraph:

[0003] Railway axles presently used are designed to have infinite fatigue life if axle surfaces are kept defect free. However, under constantly increased rail car loading and higher car running speed, and with surface defects caused by corrosion or impacts, railway axles have recently experienced high failure rate in terms of axle cracking, leading to high number of catastrophic train derailments, costing the North American railroads millions of dollars.

[0004] Almost half of the axle cracking incidents occurs at fillet or groove area where highly concentrated mechanical stresses combines with accelerated localized corrosion. However, for most of axles in service, ~~none of~~ those critical areas ~~has been~~ have not been so far ~~properly~~ fully protected in terms of:

1. Long term corrosion resistance under variable atmospheric conditions;
2. Proper impact resistance against flying hard objects from the road.

[0005] The present railway practice requires application of black tare like sealant / rust preventative in axle fillet, axle dust guard and axle groove to protect axle against corrosion pitting. The newly designed fitted bearing backing ring that is fitted onto axle dust guards with a interference ~~should~~ does improve the effectiveness of sealing of axle fillet, but still provide no protection on axle dust guards. Furthermore, large population of ~~previously machined~~ axles currently in use have smaller diameters in their dust guard areas due to lack of precision during initial machining or due to surface damages during subsequent mounting/dismounting or road services and can not achieve

designed interference fit. ~~that are~~ Those axles can only be used with non-fitted bearing backing ring ~~are not precisely machined in dust guard area and therefore~~ and can not benefit from the fitted bearing backing ring design.

Please replace paragraph [0007] with the following amended paragraph:

[0007] Actually, many coatings, such as epoxy or polyurethane types, are capable of providing good long-term corrosion protection by developing high bonding strength with substrate and forming firm/tough film on the substrate. Some coatings can even provide certain impact resistance if heavily applied. However, due to following reasons, those coatings are not the most desirable choices:

.....

Please delete paragraph [0008] which starts with "Another possible approach".

Please replace paragraph [0010] with the following amended paragraph:

[0010] Accordingly, what are needed in the art are improved methods and apparatus to fully protect railway axles and railway bearings against corrosion during long term field service while keeping the protected area easily inspected and maintained at low cost~~allowing conventional bearing mounting/dismounting practice~~.

Please replace paragraph [0012] with the following amended paragraph:

[0012] Another object of the present invention is to provide methods and apparatus that will ~~both seal~~ protect all critical areas ~~of~~ for large population of existing railway axles / axle mounted bearing components ~~and at the same time protect them~~ from corrosion and impact damages.

Please add the following new paragraph after paragraph [0018]:

[0018.1] Figure 4 is a cross sectional view of another alternative to the embodiment shown in Figure 2.

Please add the following new paragraph after paragraph [0033]:

[0033.1] During regular inspection or requalification, the previously applied sacrificial metal films can be kept or only partially removed without causing any damages on axle or bearing surfaces and additional films may be further applied afterwards on top of them.

Please replace paragraph [0042] with the following amended paragraph:

[0042] Referring to Figure 2, a railway wheel set is provided including an axle 210, a curved plate wheel 220, a roller bearing assembly 230, a sealing member in forms of a protective sleeve 240 and a rust preventative /sealant 250.

Please replace paragraph [0045] with the following amended paragraph:

[0045] The protective sleeve 240 has one end 241 pre-mounted and sealed to the external surface of the backing ring 231 of the bearing assembly 230 before bearing mounting. The full sealing is achieved by substantial deformation of initially smaller bore of the pre-mounted end 241 of the protective sleeve 240 than the outside diameter of the backing ring 231. Such sealing may be further enhanced by additional adhesive or tightening device applied to the mounting area. The other end 242 of the sleeve 240 extends out of the backing ring 231 with a length substantially longer than the length of the axle dust guard 214. The end 242 of the sleeve 240 has an inner flange 243 with a diameter larger than minimum diameter of the axle dust guard 214 but substantially smaller than the maximum diameter of the axle dust guard 214.

Please replace paragraph [0046] with the following amended paragraph:

[0046] During final stage of installation of the bearing 230 onto the axle 210, the inner flange 243 of the sleeve 240 starts to engage with the axle dust guard surface 214S and is forced to roll / flip inward before finally resting on the axle dust guard surface 214S . The mid section of the sleeve 240, which is longer than the axle dust guard 214, is forced to climb and roll onto the axle dust guard surface 214S, creating a bulged double seal in the varying diameter section of the axle dust guard surface 214S.

Under rail car loading, the axle fillet 213 and adjacent axle dust guard 214 in the railway axle 210 are subject to locally concentrated mechanical stress due to abrupt diameter changes in the axle fillet 213 and the axle dust guard 214. Upon presence of corrosive

ingredients, an accelerated corrosion stress cracking can quickly develop and lead to catastrophic axle failure. The installed sleeve 240 prevents occurrence of corrosion stress cracking by effectively stopping the ingress of any corrosive ingredients. The sleeve 240 not only provides effective seal for the axle dust guard area but also forms an additional sealing for the axle fillet 213 that is primarily protected by bearing backing ring ,fitted type or non fitted type. The protruded bulgy section of the sleeve 240 also protects the axle dust guard 214 against impact and protects rust preventative / sealing compound 250 that is applied on the axle dust guard surface 214S and now rests underneath the sleeve 240, against impact and UV aging.

Please replace paragraph [0047] with the following amended paragraph:

[0047] The protective sleeve 240 is made of any suitable material including but not limited to polyurethane, neoprene, nitrile or fluoroelastomer, other rubber, other elastomeric or plastic material.

Please replace paragraph [0049] with the following amended paragraph:

[0049] Referring to Figure 3, an alternative embodiment of ~~protective sleeve~~sealing member is provided in an identical railway wheel set arrangement as presented in Figure 2. The alternative embodiment includes an axle 310, a wheel 320, a roller bearing assembly 330, rust preventative / sealant 350 and a sealing member in form of protective sleeve 340.

Please replace paragraph [0052] [0053] with the following amended paragraph:

[0052] The mid section of the sleeve 340 is substantially longer than the length of the axle dust guard 314 thereby once bearing 330 is fully installed on axle 310, the sleeve 340 becomes bulgy , being forced into close contact with both backing ring and wheel hub, and remaining tightly sealed during long term field service. The installed sleeve 340 seals not only the axle dust guard area but also forms an additional sealing for the axle fillet 313 that is primarily protected by bearing backing ring, fitted type or non fitted type. The bulged section of the sleeve 340 also protects the axle dust guard 314 against impact, and protects rust preventative / sealant 350 that is applied on the axle dust guard surface 314S and now underneath the sleeve 340, against impact and UV aging.

[0053] The protective sleeve 340 is made of any suitable material including but not limited to polyurethane, neoprene, nitrile or fluoroelastomer, other rubber, other elastomeric or plastic material.

Please add the following new paragraph after paragraph [0054]:

[0054.1]Thanks to substantially large elastic deformation range of the elastomeric sealing material, the protective sleeve 240 and 340 are able to provide effective sealing in large axle diameter range and in large bearing backing diameter range, allowing direct applications of the arrangements presented in Figure 2 and Figure 3 on large population of existing railway axles and railway bearings with dimensions being significantly out of original manufacture tolerances.

[0054.2]Referring to Figure 4, another alternative embodiment of sealing member is

bearing backing ring 431 is a non fitted type of backing ring.

[0054.3]Instead of pre-mounting to the external surface of the bearing ba as shown in Figure 2, the sealing member 440 in Figure 4 is pre-mounted to the inner of the bearing backing ring 431, with the help of groove 439 created at the end 438 o backing ring 431.

[0054.4]The sealing member 440 is pre-mounted into the groove 439. The pre-mounted end of the sealing member 440 has inner diameter substantially smaller and outer diameter substantially larger than the axle dust guard 414. Upon installation of the bearing 430 onto the axle 410, the sealing member 440 is substantially deformed, filling the gaps between the axle dust guard and the end of the bearing backing ring and forming additional sealing for the axle fillet 413. The sealing member 440 made of an elastomer provides protection against impact damages for a portion of the axle dust guard 414.

[0054.5]Thanks to substantially large elastic deformation range of the elastomeric sealing material, the sealing member 440 is able to provide effective sealing in much larger axle diameter ranges than the existing fitted type backing ring made in steel, allowing direct applications of the arrangement presented in Figure 4 on large population of existing railway axles and railway bearings with dimensions being significantly out of original manufacture tolerances.

Please delete paragraph [0055] which starts with "It is understood that".

Please replace paragraph [0059] with the following amended paragraph:

4. **[0059]** The protection schemes are illustrated and described with the help of ~~fitted backing ring~~ particular types ~~of~~ sealing member made in single material.~~of bearing assemblies~~. It is to be understood that the present invention is also applicable for use with other ~~non-fitted backing ring type of bearing assemblies~~alternative sealing member designs with different seal profiles, different combinations of sealing material and with additional tightening accessories such as embedded springs or tightening strips.